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POLISH SOFTWARE FOR UCS COMPUTERS

Budapest SZAMITASTECHNIKA in Hungarian Oct 80 pp 12-13

[Article compiled by Janos Milcsak: "Polish Informatics Association: Software Packages for ESZR Computers"]

[Text] The basic goal of the Informatics Association of Computer Technology Enterprises in Poland is that the economic development of Poland should be accelerated by the economic use of informatics.

This work is aided by more than 6,000 computer technology experts and 52 computer centers (in which there are 80 medium and large computers including 24 ESZR [Uniform Computer Technology System] machines).

Its basic services are: designing computer centers; designing and programming information systems; initiating and operating systems; giving informatics advice; and general and special informatics instruction.

Within the framework of its own research and development work the Informatics Association works on the following themes: preparing basic software and preparing technological software.

Developed systems for the more important economic branches were prepared in the Informatics Association of Computer Technology Enterprises and these systems are operating in all basic guidance areas. In addition, using special computing systems, they do statistical processing, economic analyses and optimalization and engineering computations.

We will report on a few of the achievements in the area of new software preparation technologies.

RODAN

The RODAN data base management system is an implementation in the area of data base management languages of the 1971 reports of the CODASYL-DEGT committee and is an implementation in the area of data description language of the 1973 reports of the CODASYL-CCL. Its basic programming language is PL/I. A newly introduced storage description language, a language for auxiliary functions and a generator for direct user language represent an expansion of the possibilities of the two reports listed.

It works under the supervision of an OS/ES operational system and can be used on ESZR 1022, 1032, 1040 and 1050 computers and on the IBM 360/370 series.

The RODAN system is delivered in single or multiple packet versions. It is possible to use both versions also, which is supported by a remote data transmission monitor.

As compared to traditional technology RODAN decreases the time for planning the data base by about 25 percent and reduces the time for preparing and testing software by about 40 percent. Using a data base management system based on RODAN can reduce the burden on magnetic disk storage by about 50 percent.

SKYON

The SYKON conversational data base management system, used with a terminal network, makes it possible to retrieve from the data base very quickly the broad information of various cross-sections which is indispensable for the leadership of large economic organizations and industrial plants.

SYKON belongs to the class of so-called autonomous systems; its function is the management of formalized data bases. It provides the user a high degree of flexibility in defining the logical structure of the data. From the viewpoint of the information retrieval process the organization of the data base is based on the well known method of inverse files.

SYKON contains software tools which provide management of dynamic structures. Retrieval, processing and actualization of data can be done in both the conversational and batch mode.

The data base service module can be used in both the batch and remote access mode.

STEP

The STEP production guidance system is a combination of systems by virtue of which planning and programming work can be accelerated to a significant degree.

Using STEP for generation can produce user software which realizes production planning and guidance functions.

It consists of three groups:

--a production guidance software generation system to realize such basic functions as, for example, planning the priority of assignments, satisfying materials needs, supervising the priority of assignments, planning production capacity needs and supervising stockpiles;

--an auxiliary functions software generation sysetm to manage technical and organizational changes in production, the development of normative costs, etc.;

--a software generation system supporting an optional area of production guidance to assist in technical preparations for production and in the areas of employment and wages, materials management and management of fixed assets. The basic element in the STEP system is the programmed data base. This software is received in such a way that one can use special user languages and generating programs which work with these languages as a result of which user software is generated in the PL/I or ASSEMBLER languages.

Use of the STEP system significantly reduces the time requirement for designing and programming a user system.

SWIT

The SWIT textual information retrival system makes possible the systemization of user data, the storage of source data, the development of a data base and the retrieval of the desired information with the aid of parameters defined by the user. The system contains programs which check the correctness and compatibility of data going into the data base and it contains complete software for maintenance of the data base.

With SWIT one can retrieve the address words which are linked to one another but one can also write out the contents of the data base in the form of a bulletin on the basis of parameters provided by the user.

SWIT operates under the supervision of an OS/ES operational system and is prepared for users of ESZR computers and the IBM 360/370 series.

SYWIN

The SYWIN report generator prepared for batch processing generates programs in the PL/I language with the aid of a special program language on the basis of parameters provided by the user; the function of the programs is to retrieve and print out the desired information. More than 50 information queries can be realized in one program run.

Optional organization of the files is possible and they can contain various types of records.

The SYWIN compilation also contains special software for processing index sequential files. With these programs one can eliminate program writing in the case of files with index sequential organization.

This software (in the ASSEMBLER language) carries out the following functions: organization of index sequential files on magnetic disks; loading the data into these files from optional data carriers; reorganization of the files; and writing out the index sequential files on optional data carriers. The SYWIN system is designed to operate under the superviison of a DOS/ES operational system on ESZR computers.

SMS

The purpose of the SMS software management technological system is the documentation and storage of software. It can be used most efficiently to manage medium and large systems. Its functions are: to check the sequential versions of the modules, identifying the version serial number; to automatically store the parameters connected to the types of information (for example, the table format and the number of copies of documentation); and to provide the procedures for the language actualizing the software.

Every single actualization automatically results in a modification of every page in the desired format and number of copies.

The SMS operates under the supervision of an OS/ES operational system.

LPSERVIS

Use of the LPSERVIS program for handling linear program packages significantly accelerates the process of preparing data. The user only has to describe the problem in a language similar to a mathematical formulae and process it with the aid of the LPSERVIS programs. The result of the operation of the programs will be a card deck or a magnetic tape file which can be used as input data for LPS-360 programs.

Linear programming activity with the aid of the LPSERVIS program package can be compared to the activity of a system organizer at the time of formulating the task. LPSERVIS works under the supervision of DOS/ES or OS/ES.

APS

The APS program package represents the compilation of software which processes data obtained with the aid of the SMF program package. The task of the SMF program package is to prepare data for a definition of indexes pertaining to the functioning of the operational system, for defining software efficiency, for planning an expansion of the computer configuration, for the efficiency of user services and for an automatic determination of computer operating costs.

With the aid of programs belonging to the APS program package--using the data obtained by the SMF--new software can be obtained. The languages of this new software can be ASSEMBLER, FORTRAN or PL/I. The APS program package was prepared for an OS/ES operational system.

PATEST

The PATEST program package is a tool by virtue of which modular or structural programming work becomes more efficient. It makes possible the testing of individual modules, hierarchies and entire modular programs written in ASSEMBLER, COBOL, PL/I and FORTRAN. The program package generates testing programs and one can link into these the modules controlling the hiearchy. The modules to be tested need not be adapted.

The program package works under the supervision of a DOS/ES operational system.

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BULGARIA

PROBLEM OF RADIOACTIVE WASTE DISPOSAL EXAMINED

Sofia SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE in Bulgarian No 4, 1980 pp 5-15

[Article by Academician Khristo Ya. Khristov and Scientific Associate Georgi Stefanov: "The Problem of Radioactive Waste and Environmental Protection"]

[Text] The headlong growth of the nuclear power industry is determining the shape of the second half of our century to a large extent. The advanced countries are formulating programs according to which the capacities of nuclear power plants will be doubled in about two to three years. According to data of the International Atomic Agency, issued in May 1979, there are 232 nuclear electric power plants in operation with an overall installed electric capacity of 117,761 megawatts; 219 reactors were under construction with an overall capacity of 200,330 megawatts; 131 reactors totaling 127,084 megawatts were in the advanced planning stage. In 1980 the share of AETs [Nuclear Electric Power Plants] in world electric power production equals about 25-30 percent; according to a number of forecasts, by the end of the century it will exceed 50 percent and may even reach 75 percent (1). The expansion of the nuclear power industry inevitably results in the increase of the amount of radioactive waste. The production of one megawatt per year (of electric power) yields an average of one kilogram of fission products which, even after 5 to 6 months, remains the source of thousands of active curies. It is anticipated that by the year 2000 the overall capacity of the AETs will be about 4,250-4,500 gwt and that, consequently, the overall amount of produced radioactive isotopes will reach about 4,500 tons. At the time of their processing this will correspond to about 2×10^{12} curies (4). Furthermore, as a result of various inevitable, controlled or uncontrolled leaks, waters from the special washing areas, shower installations, and others, every day each 1,000 megawatt installed capacity yields an average of dozens of cubic meters per day of average or low active waste water which, after treatment, are converted into 30 to 40 percent dry residue. Even though low active, the latter cannot be freely dumped, for it requires hundreds of years before it has lost its radioactivity. This arises, in its full size, the problem of the elimination and storage of all such matters, some of which are necessary and valuable with a view to their subsequent processing, while others may be unnecessary yet should be carefully handled, for they are produced in the course of a few hours or days yet their radiation, needed or unneeded, useful or harmful, goes on for years or centuries.

This is a problem of importance to us as well, for we have two power reactors of 480 megawatts each (electric power), two more are in their prestart-up stage, and plans call for the building of generating capacities for another 1,000 megawatts in Kozloduy. Such reactors will be built on the second site for nuclear power reactors along the Danube River near Belene. As we know, our country is small. It has no deserts or uninhabited areas where such waste could be processed and stored without particular safety measures. The problem is, to the highest extent, not only human and technical but scientific. Furthermore, it must be resolved urgently, for it is on the agenda.

The BAN [Bulgarian Academy of Sciences] and respectively, the Institute for Nuclear Research and Nuclear Power Industry, have the responsible assignment of collecting, rendering harmless, and storing or, more accurately, burying radioactive waste which accumulates in work with radioactive isotopes in various scientific, medical, or industrial laboratories. We have at our disposal the current RAO [Radioactive Waste] storage area. The storing of waste by a nuclear power plant is a far more complex problem. Nevertheless, the institute has acquired considerable experience and, with the help of the Ministry of Power Supply, a solution could be provided considered optimum in terms of our country. Work is already underway on this problem. The present article is a survey of the means for the solution of the problem proving that, even though difficult and complex, it is in no case insoluble.

The public would like to have guaranteed radiation safety and exclude from the biospheric circulation the materials obtained in the course of the nuclear cycle. A number of subjective difficulties are created by the higher attention paid to the problem of nuclear power safety and insufficient information as to its nature. The so-called "atomic bomb syndrome," experienced by the segment of the population which is either underinformed or disinformed adversely affects the development of the nuclear power industry. Examples of this exist in some Western capitalist countries (Austria, Sweden, Canada) where the implementation of nuclear power programs have been arrested because of lack of an adequately clear concept of the processing, safe storage, and removal of radioactive waste from the human environment (2, 3) but, essentially, as the result of circumstantial and speculative reasons.

As we mentioned, radioactive waste comes not only from the nuclear power and other industry but also as the result of a number of scientific research activities, medical diagnosis and treatment with radio-pharmaceutical means, defecoscopy and other industrial activities, in the extraction and processing of uranium ore, the production of special nuclear materials, and others. Radioactive waste contains virtually all the elements and a great variety of chemical compounds. They contain natural radioactive elements or elements which are the product of human activities. Radioactive waste may be gaseous, liquid, or solid. It shares the common quality, however, that no matter how long it is preserved, it will always be potentially dangerous from the radiation viewpoint. This danger stems from the circumstance that with direct contact radioactive materials could trigger biological changes and, as mutagens, may cause biological damage in the future as well.

A basic fact related to radioactive materials is that there is no method for shortening the period of time during which a given isotope remains radioactive. A certain period of time is needed for it to decay as a stable element. Consequently, in order to protect future generations from potentially biological harm, we must isolate the radioactive waste (RAO) from the atmosphere and the human environment for long periods of time by including them into harmless stable substances.

The RAO problem is important and complex. Its solution demands a great deal of attention and competence. However, it is not insoluble. It is obvious that man who was able to release atomic energy will be able to cope with this problem which, after all, is simpler.

The grading of the RAO is most generally on their aggregate condition. They are classified into gaseous, liquid and solid. Furthermore, the RAO may be classified on the basis of their chemical activeness and radioactiveness. These parameters determine the conditions under which the RAO could be processed and transported for storing, i.e., for their final safe treatment through burial in suitable geological formations.

The nuclear reactors and the plants processing exhausted fuel are the basic sources of gaseous RAO within the nuclear power cycle. The long-living gases krypton-85, carbon-14, tritium and iodine-129, which are the products of the fission of nuclear fuel are of substantial significance. As the programs implemented by the nuclear power industry increase, the quantity of such long-lasting isotopes in the environment will be rising steadily.

A similar situation prevails with liquid and solid RAO produced by nuclear installations and systems. According to Western forecasts by the year 2000 the projected quantities of RAO will be as follows:

- United States: 1.1 billion liters of liquid RAO with total activeness of 6×10^1 million curies (6) and about 1.5×10^5 cubic meters solid RAO (7);

- Sweden: 1.5×10^5 cubic meters solid RAO with total activeness of 2.5×10^3 million curies (8);

- Italy: 3.4×10^5 cubic meters (9), and so on.

As we may see, the volume of RAO is considerable for which reason we must consider it more carefully. Yet, as we said, there is no shortage of solutions. The problem is partially alleviated by the fact that strongly active substances are usually short-lived while those with a long life have low radioactivity.

In terms of radioactivity, these materials may be divided into three categories: low, average, and highly active. These terms have been used since the 1950s as indicators of how to handle RAO and how to process and treat them under specific circumstances. The term has the same meaning today as well, even though the quantitative and qualitative differentiation among the three categories in the different countries and even within a single country varies (10, 11). In the United States and France, for example, the upper limit of low radioactive waste is 10^{-6} curie per liter; in England and the USSR it is 10^{-5} power; in Belgium it is 10^{-4}. The upper limit of average activity waste in the United States, Britain and the USSR is 10 curies per liter; it is 10^3 curies in Belgium and France. Wastes with a higher radioactivity are included in the category of highly radioactive waste.

Of late the idea has been accepted to grade the RAO quantitatively on the basis of radioactivity. However, a number of objections exist concerning the quantitative definition of these terms, for the work and effect of one curie of strontium-90 are not the same as the work and effect of one curie of plutonium. In turn, it is not identical with one curie of tritium. Generally speaking, the different radioactive isotopes require different handling. Furthermore, the definitions of low, average, and high radioactivity waste cannot be the only criterion from the viewpoint of the physical foundations of radiation safety in their use, transportation and removal from the human living environment. The RAO are complex and most varied substances which cannot be characterized with one or two-three parameters. Nevertheless, the terms "low radioactivie," "average radioactive," and "high radioactive" are understood in their broad meanings by the specialists and those involved in the processing and storage of RAO.

The radiational threat of most isotopes requires their isolation from the biosphere for hundreds or thousands of years. As early as the 1950s the following system for RAO treatment was suggested and generally adopted: filtration of gaseous RAO, concentration of liquid RAO through evaporation and the pressing or calcination of the former in sufficiently small volumes, and the burial of both in suitable geological formations. Such formations must have a proven stability of salt-containing seams as would be the case, for example, with exhausted salt mines (the existence of salt which is easily soluble is an indication of the absence of groundwater which might eventually spread radioactivity).

The nuclear power industry has adequately effective methods for the treatment and storage of RAO. Some Western countries (Britain and others) have tried the system of putting radioactive materials in concrete blocks which are dumped to the bottom of the ocean. This decision is not considered efficient because of the aggressive nature of the sea water. Furthermore, concrete is permeable and is not very stable. Some authors have suggested that the RAO be launched into outer space. Outer space is boundless and would have space for many objects useless to us. It is obvious, however, that it would be barbaric for this great achievement of man--the reaching of outer space--to be spoiled by such unseemly actions. Unquestionably, the most natural method would be for each country to bury the waste in its own territory in stable geological formations which are not in short supply. The best solution, however, which may differ according to circumstances is still not believed to have been found, for which reason intensive scientific work is going on in the following directions: First, the extraction and concentration of radioactive isotopes; second, their blocking--their placement within stable solid blocks of cement, glass, bitumen, and others; third, their placement (burial) in suitable underground areas thus insuring their definitive removal from the human living environment.

Treatment of gaseous RAO. The current method used for the treatment of gaseous RAO are developing according to the nature and composition of the gas flow released by the ventilation stacks. Usually, new technological processes are used for the Capping and removal of some radioactive gases such as krypton-85, such as kryogenic distillation, hydrofluoric absorption, adsorption, diffusion, or the utilization of selective membrane filters.

There are two basic methods for capping radioactive iodine: holding it on solid sorbents (metal exchange zeolites) or its inclusion within liquid substances. Thus, for example, some plants which restore worked out nuclear fuel use the technology of basic scrubbers (alkali-saturated water) capping the iodine in the solution. Some countries use amorphous substances processed with silver and silicic acid to eliminate the iodine from the gas flows.

Recently, particular attention has been paid to tritium because of its relatively long life (a half-life of 12.4 years) and because it is a basic component of animate matter, for which reason its presence in the biosphere is particularly harmful. Some isotope concentration processes are used for the treatment and removal of the tritium from water waste. Methods have been developed in the United States for catalytic exchange, hydrophobic catalysis, and others. Water and hydrogen distillation methods and errichment with the help of reverse electrolysis are used as well.

Treatment of liquid radioactive waste. Large quantities of low and medium-active liquid RAO accumulate in the course of the operation of AETs. A 1,000 megawatt AET produces annually up to several tens of thousands of cubic meters of water with increased radioactivity of 10^{-3} - 10^{-6} curies per liter from the flow of the first cycle and 10^{-6} 10^{-9} from the special washing, whereas normal water has a radioactivity of 10^{-13} while the admissible norm is under 3×10^{-10} curies-liter. Such waters cannot be released in the environment or be retained. As a result of intensive scientific research conducted in a number of countries sufficiently reliable methods and technologies are being developed and improved for the treatment and for rendering harmless liquid RAO so that the radioactive isotopes contained in the waste could be concentrated in small volumes and the treated waters may be used in a closed cycle by the enterprises themselves or released in open water reservoirs if the proper norms have been attained.

The methods and technologies for the processing and rendering harmless the low, medium, and high radioactive solid and liquid RAO vary considerably, as we shall see.

Low radioactive liquid RAO. The following methods and technologies are used in processing such RAO: coagulation, based on the method of combined precipitation of water oxides of radioactive isotopes together with the water oxide of the added precipitation metal; ion exchange using a system of ion exchange filters; distillation--concentration through evaporation in special evaporation systems and the treatment of the waste as highly radioactive, and so on.

Research on the treatment of low radioactive liquid RAO is focused on the further improvement of such methods and on reducing their cost. Let us point out as an example that in the distillation method the cost of evaporation per cubic meter has been reduced to 2.5 rubles (4). Research is underway to develop technologies for reducing the volume of the concentrate through freezing, the treatment of vapors from droplets obtained in distillation, the selection and use of suitable organic and inorganic sorbents, the development of methods and technologies based on essentially new processes for the processing of liquid RAO, and so on. Efforts are being made to develop technological systems based on the principle of electrodialysis and the extraction of radioactive isotopes from the solutions with the help of ion flotation.

High radioactive liquid RAO. In this case particular attention is paid to their safe removal from the biosphere for long periods of time. Experts in RAO agree on the satisfactory nature of the following method (12):

Intermediate storage in liquid form;

Hardening and wrapping of the waste;

Preservation of solid waste through technical means;

Storage (burial) forever in geological formations underground or under the bottom of the ocean.

Other alternate strategies are possible as well. Not one of them, however, has so far convincingly proved its advantages.

Treatment of solid RAO. A number of countries are working on the development of methods and technologies for the safe storage of this category waste, based on the principle of solidification with bitumen (13), cement (14) or glass (15). In the case of bitument solidification the radioactive waste which, naturally, is mixed with a large quantity of inert substances, difficult to remove, are ground into dust and mixed in melted bitumen (asphalt), after which the mixture is poured into thin-walled barrels where the bitumen hardens as it cools off. The main reasons for the interest displayed in the use of bitumen are: economy, smaller size per unit of measurement of solid RAO, relatively simple technology, good resistance of the end bitumen product, and, particularly, the low twisting and shifting of the enclosed radioactive isotopes. Possibilities are being studied to include in the bitumen a great variety of waste such as salt and hydroxide residue, concentrated liquid RAO (cubic residue), solutions, used and saturated ion-exchange resins, filtration materials, natural sorbents, and others.

Salts of liquid RAO may be injected into the bitumen in one of two ways:

1. Mixing the dry residue with bitumen after preliminary evaporation or elimination of the water from the solution.

2. Hot mixing of the solution (cube spaced residue, slime, bits, etc.) with melted bitumen and subsequent removal of the water through the evaporation of the product.

There are three basic bitumenizing systems for RAO: boiler-type bitumenizing reactors, verticle rotor bitumenizers of the mixer-evaporator type, and horizontal continuous mixers-evaporators.

Cementing, i.e., inclusion in cement blocks, is the second major technology used in the treatment of RAO. The advantage of this method is its relatively low cost and simple operational conditions. Its shortcoming is the insufficient durability of the blocks and the relatively high dilution of the radioactive isotopes they contain.

Calcification and glassing procedures are applied mainly with high-level radioactive waste. The purpose is for the finished solid form to meet specific criteria: It must be highly resistant to heat and radiation, combined with good heat conductivity and a high melting point. It must be mechanically solid and shock-resistant and have low dilution speed. Calcification is a process in which the liquid waste is evaporated to the condition of a dry product, i.e., turned into oxides. In glassing, the oxides obtained in the course of this process, mixed with flux (easily meltable components) are melted to the point of obtaining glass-like products.

However, a more extensive study conducted by American specialists (16) led to some worrisome conclusions according to which the glass-like mass obtained in the glassification of high-level active RAO is not a particularly stable matter: After a long period of stay underground, under the effect of water and air, its surface is partially destroyed and becomes soluble and releases a radioactivity of the RAO contained within it. Experimental studies were made in this connection and it was determined that boron silicate glass used for the solidification of the RAO begins to break down and to release radioactivity at 400 degrees. Furthermore, such a temperature may be reached in the course of the natural heating of the waste stored very deeply underground.

Temporary Storage and Burial of Used RAO

The building of a safe barrier against the negative influence of RAO radioactive radiation on the biosphere has provided a number of solutions to the problem of definitively disposing (burying) of RAO. Based on their economic possibilities, geographic and geological characteristics, demographic factors, and so on, the individual countries are developing their own approach to the removal of the RAO from the ecological system.

A clear distinction must be made between the concept of temporary storage and final storage or burial of RAO. The temporary storage means that further removal and transfer of RAO are necessary. In this connection installations for temporary storage are designed and operated in such a way as to facilitate the eventual transportation of the RAO to a suitable place. The final storage or burial means the final disposal of the RAO through their elimination from the human living environment without possibilities for subsequent extraction. In other words, it means storing them for an infinitely long period of time in a way to exclude any possibility for access to such waste.

The building of surface storage areas usually resolves only the problem of the temporary storage of RAO. The final storage, including that of long-life transuranium radioisotopes could be achieved also in special surface installations. Several basic concepts (17) have been formulated on the final disposal of RAO, as follows:

a. Final and definitive disposal on land in geological formations deep under the surface, below the ocean bottom, on the ocean bottom, or in icebergs;

b. Launching in outer space;

c. Transmutation processes converting long-life into stable or short-life isotopes.

Assessments of the time needed for the safe isolation of RAO usually call for about 1,000 years for the fission products and about 100,000 years for transuranium actinides. Initially, these periods may seem pretentious. In many parts of the world, however, they are within the limits of time periods for which geological events could be predicted with sufficient accuracy. At the present level of human technical possibilities the idea of isolating the RAO by enclosing them within solid masses or blocks with a view to their placement in various geological formations for final storage (RAO burial) appears the most feasible.

The basic requirement in assessing the suitability of geological formations as storage areas for the final burial of RAO is their ability to remove from the biosphere the radionucleides they contain until they decay to a safe level. In this case, the multiple-barrier approach calls for paying particular attention to the form and shape of treated RAO and the use of particularly durable containers, knowledge of the composition and chemistry of groundwaters, resistance of the artificial and natural barriers to the flow of water around the storage area, blocking the migration of radionucleides from the storage area to the surrounding geological strata with the help of various mechanisms (ion exchange reactions, filtration, sorbtion, and so on), artificial mechanisms and technical systems erected along the migration flow of groundwaters, and so on. Thick strata or diapyrite formations in rock salt are considered the most reliable geological formations for the final burial of RAO. Clay formations and solid (crystaline) rocks are another area to be studied and utilized as definitive storage areas (for the burial) of RAO.

Current Methods Used in RAO Processing and Storage in Some European Countries (12)

France. In France the problem of RAO treatment and storage is related to the broad spectrum of RAO products, ranging from low-level to high-level radioactive. The low-level and medium-level radioactive liquid waste is processed through cementing while the hard waste through pressing. The method of bitumen solidification or of including this type of RAO in molds of heat-resistant plastic is being used as well. After treatment the hardened waste is taken to the centralized storage area in La Hague. The high-level radioactive liquid RAO are glassified at the AVM plant in Marcoule, launched in 1978. A second such plant with an output of 18 kilograms of glassified mass per hour, obtained from the treatment of 40 liters of solution, is soon to be commissioned.

Since no decision has been made as yet as to the method for the final disposal of RAO the possibility is contemplated of the waste to be removed from the storage areas with a view to their further moving to their final storage area. In France the most promising method is considered to be the final disposal of RAO inside granite rock. The study of this possibility, however, is merely at its initial stage, for the factual requirement to use geological formations will arise between 1985 and 1990 along with the development of the nuclear power industry.

FRG. A characteristic feature of the FRG RAO disposal program is the development of a second combustion cycle and the final burial of RAO in the geological formations of the Asse Salt Mine. Liquid RAO are treated through mechanical filtration, evaporation and ion exchange, while solid RAO are hermetically sealed within 200-liter steel drums.

Cementing and bitumenizing are the practical methods used in hardening. The FRG is intensively developing mobile systems for waste solidification which could be transported from one nuclear power plant to another. The basic processes in such systems are cementing and bitumenizing. The solidification of RAO in plastic molds has been tried as well. The FRG uses two types of installation for the glassification of high-level radioactive RAO based on the PUREX and FIPS processes. PAMELA, a third process, is under development. It calls for the conversion of phosphate glass into granules which are included in metal matrixes. The FRG is studying the use of iron ore mines and shafts in which to bury the RAO.

Czechoslovakia. The liquid RAO from the uranium industry are processed through ion exchange and co-precipitation. The shavings from the treatment of uranium ores are accumulated in special storage areas covered with dirt and vegetation. Liquid RAO from nuclear power plants are treated through filtration, ion exchange and evaporation. They are temporarily stored in reservoirs; they are hardened through vacuum cementing and bitumenizing. A film-evaporation rotary apparatus is used in the latter process operating at temperatures in excess of 150 degrees in which liquid RAO and the bitumen emulsion are poured. An industrial enterprise for RAO processing is under construction in Jaroslavskoe-Bohunice.

The RAO from nuclear power plants will be buried in waterproof storage areas close to the surface of the ground (no more than five meters deep) in Moravia and Slovakia.

The RAO generated by research centers, medical institutions and industrial enterprises are stored in limestone mines in the vicinity of Litomerice. Czechoslovakia has a storage area for the final burial of uranium industry waste near Jachymov and in an exhausted old uranium mine.

Hungary. In formulating their program for the processing of RAO, the Hungarian specialists take into consideration the fact that they will not have high-level radioactive waste. Technologies are being developed for the cementing, bitumenizing, and evaporation to dry substance of liquid RAO using hot air. Particular attention is being paid to the method of evaporation and drying with hot air in special twin-wall steel containers. The dry residue of the containers is covered with cement and bitumen with a view to its underground burial. This treatment method is relatively easy and considerably less expensive than the others. However, it offers no advantages or special guarantees even in underground storing because of corrosion and other processes over a longer period of time. Treatment through pressing is contemplated for solidified RAO.

Hungary has built a central RAO storage station for waste from the use of radioactive isotopes from scientific, medical, and industrial activities. Presently, concentrates of processed liquid RAO are cemented and dumped in special storage areas.

GDR. Here the RAO treatment program is based on the concept of providing conditions for temporary storage in the vicinity of major RAO sources. A program and a technology have been elaborated for the treatment and burial of liquid RAO in deep geological formations (salt mines).

USSR. A number of methods and technologies are undergoing development and experimentation for solidifying through the hardening of low-, average- and high-level radioactive liquid and solid RAO. Possibilities are under study to inject low-level liquid RAO through deep drills in suitable geological strata, insulated from upper water-bearing layers by the waterproof clay formations.

Methods and technologies are being developed for the processing of low- and average-radioactive liquid RAO on the basis of such systems through coagulation with suitable chemical agents, ion exchange through organic and inorganic sorbents, evaporation in special systems and subsequent hardening in solid materials through cementing or bitumenizing. According to the Soviet specialists the safest and most economical method, at least for the Soviet Union, is that of storing concentrates of low-level radioactive RAO in cement blocks. Studies and experiments are being conducted to determine the resistance to radiation of various brands of cement with a view to using them in the construction of large trench-type storage areas on the surface. Intensive efforts are being made in the Soviet Union to develop technologies and technological systems for the bitumenizing of low- and average-level radioactive liquid RAO through the use of (chemical) reactors of the boiler type, used for mixing and evaporation, vertical blade mixers-evaporators, and others.

Since 1966 successful experiments have been underway in Dimitrovgrad (USSR) for the burial of liquid RAO by pressurizing them in deep wells in suitable geological formations (caverns), reliably protected from the dynamics of groundwaters (18, 19).

Studies are also underway on technologies for the hardening of high-level liquid RAO through glassification. Such experiments involve the use of highly productive technologies based on the two-step process which includes clacination (dehydration) in a boiling stratum and subsequent injection of the dry residue into phosphate or any other easily melted type of glass.

It is precisely the vast range of research involving the use of different methods and technologies for the treatment and storage of gaseous, liquid and solid RAO that is characteristic of Soviet science and practice today. Experience will be the best proof of the system which will be selected according to circumstances.

Research in the Bulgarian People's Republic in RAO treatment and storage. Long before a nuclear power industry was started in Bulgaria, the Institute for Nuclear Research and Nuclear Power Industry (IYaIYaE) of the Bulgarian Academy of Sciences had initiated research projects on ways, means and technologies for the treatment and storage of various liquid and solid RAO, including biological and inorganic. Since 1967 the IYaIYaE has had a national base for the treatment and storage of liquid and solid RAO from the use of radioactive isotopes in scientific research, medical diagnosis, therapy and industrial activities in Bulgaria. In connection with the deactivating of liquid RAO the institute developed a method and technology for the sorbtion of radioisotopes from liquid RAO using inexpensive and easily available natural sorbents (clinoptilolite and vermiculite) poured in bitumen containers. This is a convenient method for reliable underground storage. This original method is familiar to and acknowledged by the rest of the world as the Bulgarian "shell method" for the treatment of liquid RAO. Long studies have been made of the possibility to use inorganic sorbents of the zeolite type, available in our country in virtually inexhaustible amounts. These studies were the base for the method and technology developed by the institute with the active participation of specialists from the Kozloduy Nuclear Power Plant involving an experimental system for the deactivating of low-level radioactive waters from the special flushing system of the Kozloduy Nuclear Power Plant. A technology and a system for preliminary foam separation--treatment of liquid RAO from PAV [Surface-Active Agent], using the foam separation and further treatment method with modified kieselguhr, were developed as the result of the existence of considerable quantities--up to 500 mg per liter--of surface active agents (PAV) which adversely affect the sorbtion of radionucleides by inorganic sorbents. The modified kieselguhr is obtained through a technology developed by the Institute for General and Inorganic Chemistry of the Bulgarian Academy of Sciences. The installation which includes systems for preliminary foam separation of the PAV and the ion sorbtion of radioisotopes on natural sorbents, operating on a semiautomatic basis, is undergoing experimentation in industrial conditions at the Kozloduy Nuclear Power Plant with a view to its application in 1980.

Bitumenizing is one of the basic and widely applied methods for the treatment--injecting into solid material--of liquid RAO, i.e., of the concentrate (condensed residue) of such materials. A joint group from the institute and the Kozloduy Nuclear Power Plant is conducting research on optimizing the technology for bitumenizing liquid radioactive waste and concentrated cubic residues from the nuclear power plant using the boiler-type laboratory systems developed by the IYaIYaE and of the rotary-blade type used at the Kozloduy Nuclear Power Plant.

The question of eliminating the migration of radionucleides into nature and the human living environment through the underground storage of RAO is a determining factor in the choice of the technology used for their treatment. In this respect the bitumenizing of RAO is one of the most reliable methods. The institute has extensively studied the seepage of radioisotopes injected into bitumen blocks under the influence of groundwaters up to two meters below the surface. It has been proved that even under such relatively adverse conditions the seepage, i.e., the migration of radioisotopes from bitumen blocks is virtually nonexistent. Consequently, this important stipulation of reliability in the final burial of bitumenized RAO in suitable underground areas has been met.

The definitive treatment of the RAO through burial in suitable geological strata is the third step in the problem of the definitive safe disposal of the RAO. The storage areas which are built for the final burial must meet conditions of providing reliable storage for hundreds or thousands of years with adverse effect on the human living environment. The best such conditions are the worked out salt mines which are protected from the dynamics of deep or shallow water flows. Mine shafts of uranium and other ores are being studied and used for the same purpose.

Currently a group of scientific workers--engineers, chemists, physicists, geologists, geophysicists, physicians, and others--from the Institute for Nuclear Research and Nuclear Power Industry and the Unified Center for the Earth Sciences of the Bulgarian Academy of Sciences, the Ministry of Power Supply, the Ministry of Public Health, the Ministry of Mineral Resources, and the Committee for the Peaceful Utilization of Atomic Energy are engaged in preliminary geological, hydrogeological, and technological studies, with a view to providing reliable radiation safety in identifying suitable areas in Bulgaria for building a central storage for the final treatment and burian of RAO following treatment with foam separation, ion sorbtion, and bitumenizing or cementing.

The problems of the treatment, temporary storage and sanitizing with a view to the final burying of RAO are quite complex and varied. Unquestionable, however, they are within the range of current scientific and technical achievements. We can see that the problem is not one of seeking an unknown solution, for the solutions are known and are even quite abundant. The problem is to select a solution which, under given circumstances and at a given stage would be the most adequate for a given country. The definition of such an optimum decision is forthcoming and such problems will be clarified in the immediate future both globally as well as in our country. Unquestionably, such problems will be resolved in such a way that the RAO will have no adverse effect on human living environment today and in the future, nor would it be an obstruction in the development of large-scale power industry in the future--nuclear power in its three basic elements--heat neutrons, breeder reactors, and thermonuclear synthesis.

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5003 CSO: 2202

OVERCOMING SYNCHRONIZATION ERRORS IN ES 1022 COMPUTER

Budapest SZAMITASTECHNIKA in Hungarian Oct 80 p 5

[Article by Gyorgy Ruttkay: "Overcoming Synchronization Errors in the Switching System of the ES 1022 Computer"]

[Text] Our institute, the Construction Economics and Organization Institute, has developed and operates a regional computer network within the branch. At present the ESZR [Uniform Computer Technology System] members of the network are the following: four ES 1020 B's, three ES 1022 B's and one ES 1040.

The technical condition of the equipment is good, as is proven by the 1979 data on technical up-time: 88.2 percent (average) for the ES 1020 B's, 87.9 percent (average) for the ES 1022 B's and 88.8 percent for the ES 1040.

(Technical up-time is the ratio of annual connected machine time to the total time devoted to maintenance, repairs and the overcoming of faulty operation during the same operational period).

Even more reliable operation is held back by the frequent "system binding" or "hard-waits" which fortuitously but characteristically appear during load peaks. The user must take into consideration that the danger of a "hard-wait" increases in proportion to the running time of the job. Another unfortunate consequence is that the load peaks are also processing peaks.

A stop without the indication of an error necessitates a detailed analysis of the environment. In what follows we will describe the discovery and overcoming of such a concrete error phenomenon.

A Description of the Error

The operators noted that on the ES 1022 computers, in a multiprogram environment, a reading of the data error magnetic tape caused a central unit machine error. As a test, in the course of correction, we used as a sample task an example judged critical: We tried a PL/I translation in one partition and a copying of the data error magnetic tape in another partition. In the monoprogram mode the translation went perfectly while the copying indicated the reading error, in accordance with the requirements. In the multiprogram environment we found two types of error:

a. a parity error (RDOP) in the data registers for machine stop (TO) and operational memory in such a way that statically the parity of the registers is correct;

b. a closed micro-instruction chain from which one can escape only by erasing the system.

We did the experiment in the environment of a DOS plus POWER operational system but later, in the course of our experiments, we discovered that the error is independent of the operational system.

Going beyond the magnetic tape subsystem, the error also appeared in the magnetic disk subsystem where the discovery of the problem was aided by the technical test (DGSS) provided by Robotron for the ES 1040--the same error could be produced by the selection which tests the exchangeability of the data carrier.

The Error Environment

Of the two error phenomenon the magnetic tape error could be traced to the one described in point b.

In the second selector channel (the magnetic tape units operate here) the unit gave a so called "final state byte." A "final state byte" appearing as data in the interface contains a bit combination indicating "channel completed" and "unit completed."

Of the interface identifiers the logic level of the "select from channel," "peripheral operating" and "control from peripheral" (VBR-K, RAB-A and UPR-A) is high, from which it follows that there was an I/O break which would have to have been inititiated by the microprogram (SERVS) serving the selector channel. The fixed initial address of the SERVS microprogram can be filled if the control unit accepts the need for a break and authorizes the filling of the initial address in the address register of the microprogram storage. The fourth bit of the register blocking a microprogram break in the common channel has a high logic level and indicates that the SERVS microprogram is being executed. This condition blocks any other I/O microprogram break until it is completed or until it reaches a condition where it can be broken for a higher priority need. The SERVS microprogram does not figure in the error microprogram cycle despite the fact that the condition of channel control indicates that it does. The branch conditions of the microprogram develop in the channel so the flip-flop determining this has a high logic level also. Independent of whether processor or channel microprograms are running, the branch condition is a function of channel state. As a result it is possible for there to be a parity error in the data register of operational storage if, due to badly developing conditions, the RDOP register integrates the contents of the register for break requirements (GRP). A parity error appears in the data register independent of the parity of the units--in this case by chance.

To sum up: the cause of the error phenomenon is that the state of channel control indicates operation under the SERVS microprogram but this has not yet begun.

The error condition can arise in two ways: some other information overwrites the address register of microprogram storage in the address filling interval, or the fixed address is not filled.

Measurement can take place with an auxiliary circuit which, by removing from storage authorization for address filling, forbids the rewriting of the address register during the filling time. As a result of this the address register remains empty; thus during the authorization time for fixed address filling the information, that is the initial address of the SERVS microprogram, does not arrive. The phenomenon suggests a synchronization error. The error can be overcome by using synchronization impulses which deviate from the original ones and by logical transformation of the given circuit.

Operational Experiences

Our institute has found this same error indicator on the ES 1022 B equipment of Bulgarian and Soviet manufacture. The users did not notice the indicated error on the computers after modification. There has been no observation from which it could be concluded that the operation of the modified circuit would become critical under other circumstances We informed the Bulgarian manufacturing enterprise about the error discovered and gave them the techncial documentation for the modification. We will be happy to provide domestic users of the ES 1022 computers with information about the details of the modification.

8984
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HUNGARIAN EXPERIENCE WITH ISDOS SYSTEM

Budapest SZAMITASTECHNIKA in Hungarian Oct 80 p 11

[Article by Mrs Lajos Ivanyos and Jozsef Kiss: "ISDOS--In The Eyes of the User"]

[Text] If the test of a pudding is the eating of it then the test of a program is the using of it. We began to work with the ISDOS system at the KFKI [Central Research Institute of Physics] in 1978-1979. We ran the 2.1 version of the program system on our ES 1040 computer under an OS operational system (this version was implemented by the SZAMKI [Computer Technology Research Institute]).

While becoming acquainted with the new program system the user came into contact for the first time with the user documentation. Detailed descriptions of the ISDOS were available in both English and Hungarian. This made a good impression. A brief description of the ISDOS of a survey character suitable for organizational or systems technology experts was lacking (and is still lacking). To make up for this we are forced to give a verbal explanation, demanding much time, before any ISDOS applications.

The compilation into an ISDOS model of orders for computer systems (requests for proposals) promised to be an interesting applications area. Domestic experience in the 1970's showed that in general enterprises and institutions ordered machines (configurations) from computer manufacturing firms when they knew at most the general outline of the tasks they wanted to use the configuration for; selecting and describing the tasks came only later. Every sign indicates that in the 1980's the Hungarian economy will reach the level where customers will order systems to solve concrete problems. A common language to formulate the task would be useful in the buyer-seller dialog. We used ISDOS to test the modelling of a delivery task. Our experiment was not entirely successful. We found two reasons for this. In the first place the ability of the purchasing firms to provide data (basic information about the task to be carried out) was not adequate and in the second place the concept set of ISDOS did not prove flexible enough. Despite this we are convinced that within a few years we could have a specifications language in this area which could be extended (with an expandable concept set).

As a second application of ISDOS we selected a task for which the existence of all necessary data was guaranteed in advance. We took as a base a fully developed system plan. The task was a business administration one; relatively few operations had to be performed on many types of data. Here we used ISDOS to collect the data and to disclose contradictions. We described the data to be found on the documents, the internal data imagined in the system plan and the origin of the data. The analysis of the data (documents) was handled well in ISDOS; the redundancies and contradictions come out as they are described or analyzed. In our opinion the present version of ISDOS can be used well for such an application.

We tried formulating with ISDOS the specifications of an existing program system. It would be good to have a computer tool for the specification of our real time tasks too. In these areas we were unable to use ISDOS. We found the chief problem in the fact that even in describing the information system we ran into the limitations of the PSL. We found that PSL offers very weak tools to describe the interdependencies of running conditions and tasks (system dynamics); it does support the formulation of sequential tasks (which can be processed in the batch mode).

It appears from the foregoing that the application os ISDOS is not going smoothly; most often it runs into serious difficulties. In our opinion three factors play a role in this:

--We are using a very old version of ISDOS (we could get only the 2.1 version through the SZAMKI although a 5.1 version exists); in general the concept set of this is not sufficient for a formulation of our problems;

--Everyone, we also, tended to expect miracles from ISDOS applications, namely that task formulation would be substantially easier, representing hardly any work; the experience was that you had to sweat as much with ISDOS as you would manually, but the result--the system plan, the analysis--was of better quality, more easily surveyed and more understandable to others (being in a common language) and subsequent modification was easier. (We should note that with the IPT method of IBM it was found that its introduction meant a decrease in output and only after a transitional period did those introducing the method reach performance higher than the original. This is a general phenomenon in introducing new methods and ISDOS is no exception.);

--We tried out ISDOS not only in its original applications area so many problems derived from this. It is much better suited to traditional business systems.

Despite all the extenuating circumstances the limitations of ISDOS are facts. Since we do not have another specifications system which can be run yet we think it is useful; it will help gain experience and learning. It was a strong limitation for us that some of its programs are of very great extent and run only on IBM compatible machines; the MSZR [microcomputer system] series is not available so the users of MSZR computers do not enjoy the advantages of their own machines.

On the basis of our experience we will be able to use for real tasks, for specification purposes, only an extendable specifications language which, if possible, can be implemented on MSZR computers too. We are informed that large computer implementation of an extendable specifications language (SDLA) is being developed at the SZTAKI [Computer Technology and Automation Research Institute]. Hopefully we will be able to test the SDLA soon (perhaps on an MSZR computer too).

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COMPUTER CONTROLLED PRODUCTION SYSTEMS NEARLY OPERATIONAL

Budapest NEPSZABADSAG in Hungarian 5 Dec 80 p 5

[Summary] A computer-controlled production system, probably unequalled in East Europe, is expected to become operational at the Csepel Machine Tool Factory in the near future. It consists of seven machines five of which are machine tools. There is also a 32-meter long supply line along which a robot will place work pieces. The M-6 machine tools will be linked to the computer in 1981. Introduction of the system is expected to triple productivity over parts of the factory which use conventional equipment.

Production at Csepel has been keeping pace with international standards. This has been necessary, because over half the factory's output goes to capitalist countries. These consumers demand machine tools which can become part of a prodcution line or else they require complete production systems. Thus the Hungarian factory has had to learn through its own experience how to put together such a production line and of what it should consists.

Currently four such or similar production line are being built at machine industry enterprises. In addition to the system of Csepel, one is being readied at the Machine Tool Industry Works (Szerszamgepipari Muvek); another at the United Electrical Machine Factory (EVIG), while the fourth is being installed at the Driving Mechanism and Painting Equipment Factory (Hajtomuvek es Festoberendezesek Gyara). Of these, the most extensive and exciting is the one in progress at Csepel. Upon its completion, 30-40 highly-skilled, much sought after horizontal lathe operators will be free to work elsewhere.

The computer program evolved for Csepel by the Computer Technology and Automation Researdh Institute (SZTAKI) of the Hungarian Academy of Sciences will permit the machines to operate as the need arises rather than in set sequence. In addition to SZTAKI, the Machine Industry Technology Institute and the Control and Computer Technology Institute of Csepel played important parts in devising the Csepel system.

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DESIGNING, DEVELOPING AIDS FOR MICROPROCESSOR DEVICES

Budapest MERES ES AUTOMATIKA in Hungarian Vol 28 No 10, 1980 pp 370-374 manuscript received 9 Jan 80

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[Abstract] Two development aids, developed at the Research Institute of Metrology and Computer Technology of the Central Physics Research Institute, are described. (1) The minicomputer-based development system aids in the development of devices assembled from modules of the MMPS (Multi-Micro-Processor System bus). Its memory (as well as that of the minicomputer) may be filled with the user program, and its content can be read out or modified; step-by-step execution of the commands is possible; the internal registers of the microprocessor can be read out and modified; and programmable cutoff points can be specified. The device may also by used for troubleshooting and the memory may be divided between the already completed user memory and the minicomputer memory. The final, checked user program may be entered in the REPROM or the PROM with the aid of the standard peripheral devices of the system. (2) The universal microprocessor development system (UMDS) employs the microprocessor itself as a component of the development system, using the principle of in-circuit emulation originally developed by INTEL. It features two microprocessors, one the so-called master unit and the emulating unit. The two units are separated by the system bus. One unit, based on the Z-80 microprocessor, has a central processor unit, RAM and ROM memories, a control module, and interfaces for the peripheral devices. This unit is used to write, improve, and translate programs, as well as to carry out PROM or FPLA programming, documentation, and so forth. The other unit, consisting of the emulator module (replaces the user's microprocessor, emulates the user's memory, and realizes the emulation of the user's input/output units), the condition module (states four independent conditions before starting the program), the event module (compiles and stores up to 256 40-bit events such as processor control signals, data and address contents, and hardware symbols), and the RAM memory (which is also used by the microprocessor), performs the actual tasks. Its software consists of the Editor, Assembler, File-handler, Debugging, and Utility programs. The system can be used effectively to develop and debug microprocessor-based systems of various degrees of complexity. Its modules may be interchanged, and its programmable emulation feature permits the simulation of the microprocessor, the memory, and the interface circuits of the user system, as well as provides autonomous program tracing and oscilloscope-starting pulses, so that it may be used to develop system hardware and software of practically any microprocessor-based system. The two aids described save designing and developing costs and time. Block diagrams and application examples are described to illustrate the operation and use of the aids. Figures 3; references 4: 1 Hungarian and 3 Western.

2542
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CURRENT OBJECTIVES OF SCIENTIFIC RESEARCH, DEVELOPMENT

Bucharest SCINTEIA in Romanian 31 Oct 80 pp 1, 4

[Article by Ion Teoreanu, vice-chairman of the National Council for Science and Technology]

[Text] Romania's 1981 unified plan for socioeconomic development, formulated in full concurrence with the decisions of the 12th Party Congress, assures a good beginning for the nation's entire economic and social development during the next five-year plan. The provisions of the plan start with the fundamental objective -- emphasized by Nicolae Ceausescu in his speech to the recent plenary session of the Central Committee of the RCP -- "of moving into a new stage of socioeconomic development which will bring our country into the new phase of intermediately developed country, will produce a new quality in all areas, and will shift from quantitative accumulations to a new quality of labor and life in all sectors."

It is evident that the growth rates for 1981 envisage a consolidation of this five-year plan's accomplishments by stressing all intensive, qualitative factors in all sectors of activity, thus assuring a dynamic, balanced, and efficient development of the national economy, particularly in the branches and sectors which derive the greatest value from energy resources and raw materials.

The fulfillment of these objectives depends directly on the elevation of scientific research to a new and qualitatively superior stage. In the unified national plan for 1981, the provisions concerning scientific research, technologic development, and the introduction of technical progress -- formulated under the constant guidance of Nicolae Ceausescu, secretary general of the RCP, Chairman of Romania, and under the direct and highly competent leadership of academy-member, Dr-Eng Elena Ceausescu -- have been conceived as an important starting point for the new five-year plan, closely bound to the essential needs of the national economy. The plan includes more than 2500 formalized topics of scientific research, technologic development, and introduction of technical progress, of which nearly 2200 are intended for the development and modernization of material production, in close correlation with the other sections of the plan, thereby creating the possibility for the provisions of production and investment plans to be fulfilled on a modern scientific and technological basis.

During 1981, approximately 95 percent of the total value of the new and modernized products which will be placed in fabrication, will be the result of domestic designs, eliminating a large portion of imported foreign knowledge. To this end, the formalized plan alone foresees the placement in production of more than 500 groups of materials and consumer goods, machinery, tooling, and installations, of approximately 160 new technologies, as well as the implementation of 65 systems of mechanization and automation. Moreover, a large number of objectives in scientific research, technologic development, and introduction of technical progress, which lead to the achievement -- as early as 1981 -- of new products and technologies, are included in the plans of ministries, and are not formalized in the unified national plan.

The plan contains a number of objectives for identifying and exploiting new natural resources, especially new coal and fuel shale deposits, and new geothermal resources; increasing the recovery factor in oil extraction; optimizing deep drilling and extending ocean drilling; and comprehensively exploiting volcanic tuffs, with zeolite tuffs in particular. In this respect for instance, greater use will be made of technologies for secondary and tertiary exploitation of crude oil in wells by applying the most modern processes, and particularly those that use micellar solutions and underground combustion. At the same time, technologies will be established for exploiting bituminous sands, a domain which is still lagging, the situation having been justifiably criticized by the secretary general of the party. With regard to volcanic and zeolite tuffs -- areas of great worldwide interest -- in which we have already achieved some success, research and utilization will be expanded in the chemical and petrochemical industry (catalytic systems, ionic exchange processes), in agriculture (as soil amenders and fodder), and so on.

Important objectives are also planned in the exploitation of new sources of energy. Unconventional sources -- solar, geothermal, and wind power, biogas, and others -- will be used in new areas of activity (construction materials, wood processing, the light industry, agriculture, constructions), contributing an energy of more than 300,000 tons of conventional fuel. Nearly 200,000 square meters of solar panels will be installed during 1981 alone.

A large number of objectives in the chemical industry, the metallurgical industry, machine construction, the construction materials industry, the light industry, and so on, are aimed at the development of new or modernized technologies, with a reduced consumption of materials, power, and fuels, with the most extensive use of domestic raw and other materials, and with the fabrication of products that are competitive in exportation.

In the chemical industry for instance, we will stress "low tonnage" chemistry, that is, the manufacture of highly processed products which are especially in demand by the aeronautical, electronic, microelectronic, pharmaceutical, dye, lacquer, and other industries, and which were mostly imported. For instance, solely by placing in operation six new catalyst production plants during the next year, which together will yield more than 11,000 tons, we will spare the country a currency effort of nearly 36 million dollars. Similar massive importation reductions, assessed at several hundred million dollars, will be obtained by the domestic manufacture of a great number of new, high-technology products, machines, tooling, instruments, and installations, as well as materials for various purposes, all of them the fruits of our own research.

Objectives of great interest are foreseen in the utilization of reusable materials. These concern primarily the exploitation of more than 7 million tons of metallurgical slag --from which some useful mineral substances in short supply will be extracted with existing technologies; the use of more than 1.5 million tons of thermoelectric plant ash in the cement industry and in constructions; and the recovery and processing of more than 100,000 tons of used rubber items and tires. Similar large tasks are envisaged for other categories of materials, such as some sub-products derived from technologic processes, plastic items, used mineral oils, household scraps, and leather scraps, all of them illustrating the increasingly intensive participation of scientific research and technical engineering in the solution of one of the major problems in our national economy: the utilization and introduction into the economy of all usable secondary materials.

The formulation of next year's plan has taken into consideration the provisions of the special plans drawn by the National Council for Science and Technology in collaboration with various ministries. This collaboration is also obviously necessary in the future for completing the proposed tasks. As the secretary general of the party has pointed out, the programs in the technical progress sector have not been fully fulfilled during the current five-year plan, because many of the achievements of research have not been introduced into production on time. That is why, during the period to come, research staffs and specialists in industry must collaborate more closely for the implementation of research results in production.

The responsibility for fulfilling these tasks, and for fully meeting the requirements of this important stage of our country's development -- characterized by a lower demand of material investments and a greater need of knowledge investment -- falls both upon the National Council for Science and Technology, and upon the decision makers in ministries, centrals, and industrial enterprises. As the secretary general of the party has stated, we will thus be able to consolidate that which we have achieved, become more competitive in the world, and derive better value from our available resources.

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NEW CENTER FOR RESEARCH ON REAGENTS ESTABLISHED

Bucharest BULETINUL OFICIAL in Romanian Part I No 100, 25 Nov 80 p 1

[Council of State Decree on the establishment of the Center for Scientific Research and Technological Engineering for Reagents, subordinate to the Central Institute of Chemistry]

[Text] The Council of State of the Socialist Republic of Romania decrees:

Article 1--As of 1 November 1980 the Center for Scientific Research and Technological Engineering for Reagents, with headquarters in Bucharest Municipality, is established subordinate to the Central Institute for Chemistry.

The Center for Scientific Research and Technological Engineering for Reagents is organized as a research unit, without juridical personality, as a component of the Dudesti chemical enterprise, with headquarters in Bucharest Municipality, and has as its object of activity the devising of technologies for the manufacture of chemical reagents with guaranteed purity, for chromatography and spectroscopy, with electronic purity, pure products for synthesis, used as intermediaries in the drug, cosmetic and dye industries.

Article 2--The Center for Scientific Research and Technological Engineering for Reagents is in branch group IV and compensation Level I will be applied.

Article 3--The necessary working cadres will be assured, in the framework of the plan for the labor force and the remuneration of labor of the Ministry of the Chemical Industry, approved for 1980, by transfer in the interest of the job from the Dudesti chemical enterprise and the Chemical-Pharmaceutical Research Institute with headquarters in Bucharest Municipality.

As the activity develops, the necessary working cadres and investment funds will be provided by the Ministry of the Chemical Industry by annual plans.

Article 4--The Center for Scientific Research and Technological Engineering for Reagents will carry out specific analyses and quality control for products currently being manufactured for use as reagents, and it will carry out works of technological design and provide blueprints for installations needed for the production sections and pilot sections in the Dudesti chemical enterprise.

Article 5--Annexes Nos 1, 2, 3, and 4 of Council of State Decree No 112/1977 on measures on the organization and operation of the Central Chemical Institute--

Icechim are supplemented with the addition of the "Center for Scientific Research and Technological Engineering for Reagents."

NICOLAE CEAUSESCU
President of the Socialist Republic of Romania

Bucharest, 21 November 1980

No 350

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LASERS USED FOR TRANSMITTING INFORMATION

Bucharest ROMANIA LIBERA in Romanian 24 Nov 80 p 5

[Article by Virgil Lazar: "Communications by Laser"]

[Excerpts] At the second edition of "Napotehnica '80," the exhibition of technical creativity, opened recently in Cluf-Napoca, one of the displays which arouses special interest on the part of the public also illustrates a new performance of teaching cadres in the polytechnical institute in the locality who have utilized the technology and system of transmitting information by laser, the prime beneficiary being the Bucharest calculator enterprise. The achievement is the work of a collective composed of Prof Dr Arpad Kelemen, Lecturer Eng Dr Mircea Crivi and others. In connection with this new Romanian technology we asked for some details from Arpad Kelemen, dean of the faculty of electrical engineering. He told us the following:

"The achievement is that of the electrical engineering research laboratory and it represents a special success. We have experimented with the transmission of information by laser between the 'Intercontinental' Hotel and Casa Scinteia and the results have been good, as expected. As an immediate application, the system will be used in computer centers as a wireless connection between computers and terminals and in the future, because of its effectiveness and because of the fact that a large amount of data can be transmitted by this means and because of the fact that it does not need wires, it will have broader use. The Romanian premier in laser communications is based on a world premier achieved in our faculty by the realization of complex motors capable of acting with continuous current on the system, step by step, which permits the efficient and exact positioning of the laser wave launched in space.

"These universal motors which were presented this year at the world congress on electrical activation in Greece were the object of great interest. In the discussions, the participants stressed that we are in the forefront in regard to the achievement of such types of machines and the possibilities for using them. Indeed, the positioning possibilities offered by the universal motors created by the Cluj polytechnical institute have led our collectives to another important field: the construction of robots, a task they approached headlong, encouraged by the success of the laser wave. Soon, we will talk about robots achivated by universal motors which can position every movement in time and space."

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